ESA-127 FINAL Public Report – Eka Chemicals

Introduction:
The Eka Chemicals plant in Columbus, MS makes two chemical products used for bleaching in the pulp and paper industry. It receives raw materials, principally common salt, NaCl, and, initially, via many electrolytic cells, begins production of Sodium Chlorate, $NaClO_3$. Hydrogen gas, H_2, is a byproduct and is used in the production of highly concentrated Hydrogen Peroxide, H_2O_2. The unused portion of this hydrogen, emerging from production, is then used together with supplemental natural gas to fire the boilers.

Objective of ESA:
To provide technical assistance targeted to reduce fuel expenditures.

Focus of Assessment:
The U.S. DOE qualified specialist and Eka Chemicals personnel used the Steam Tools Suite to conduct an abbreviated steam system assessment of the facility. Following a most thorough safety orientation, inputs were gathered from company information systems and vital measurements were made. Because of the relatively small size of the steam system a full model of the system was built and via the 13 (one header) SSAT "Projects" potential savings were explored for validity and recommendation.

Approach for ESA:
SSAT model inputs were largely available to the specialist and site lead, and many (but limited elements) had been discussed with plant personnel before the visit (a non-disclosure document was put into effect.) However, it was necessary to discuss and obtain inputs with a number of diverse operational and supervisory staff as well from appropriate output screen displays. Typical steam demands were available from information systems, but can later be normalized to desired capacity production levels or annual averages. The natural gas use at the plant is typically about 1/4 of all fuel (used along with the hydrogen) and a degree of care was necessary to account for this using efficiency data for hydrogen previously obtained.

General Observations of Potential Opportunities:
Plant boiler operations' personnel were found to be hesitant to operate equipment at lower excess Oxygen levels, possibly due to older controls. This was indicated by both screen displays and two boiler stack measurements. The company is committed to installing a single new, more efficient and automatically controlled boiler (with low NOx burners) to replace the two older ones now in use. Also, a higher condensate return is possible, excluding demand which cannot be returned. In spite of notes on SSAT software, initial and later analysis did not indicate that the use of turbine generation is a winner at present and this confirmed pre-ESA investigations.

The impact boiler was taken as the one operating at the higher %XO2 and stack temperature, but without any hydrogen fuel. While hydrogen yields a lower combustion efficiency and typically is approximately 20% of the fuel being fired and tend to reduce the net efficiency, based on first order approximations, the dual-fired boiler at the time of the visit was operating at a somewhat higher efficiency that the impact boiler.

Principal savings opportunities identified were from classically increasing the combustion efficiencies via a decrease in %XO2 to 2% from 7% and stack economizers to reduce stack temperatures to 250^{o}F. Increased condensate return from 70% to 85.8% is also an attractive option. Some very modest improvement via insulation was included using model defaults. All measures were judged to be medium term in nature.

The above measures, all Medium term ones, as noted above, are estimated to save 17.6% of 2005 natural gas costs, using total annual costs. However, this percentage would range from 11.8% to 24.8% on a monthly basis if the high and low monthly prices from throughout 2005 were considered.

Management Support and Comments:
The company desires to limit or eliminate the need to purchase the (supplemental) natural gas now necessary via sound conservation opportunities. It was understood that the process-generated hydrogen can then be entirely adequate for production requirements, and high and variable natural gas costs may be the driver to finally accomplish this goal.

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